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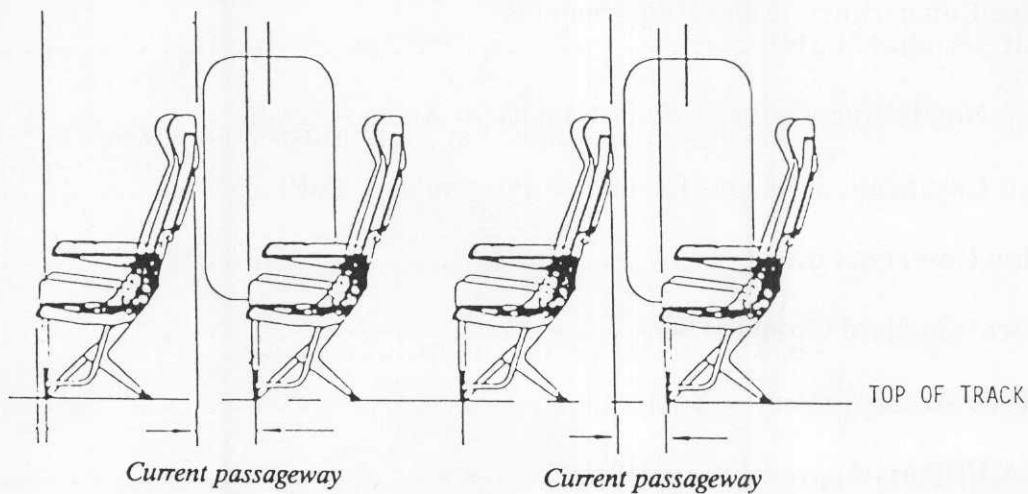
Federal Aviation
Administration

DESIGNEE NEWSLETTER

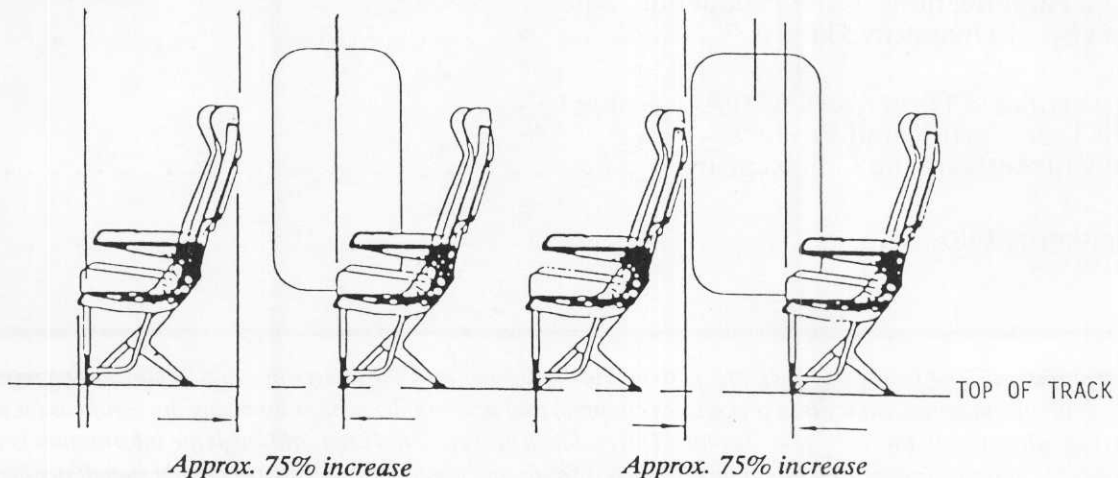
Transport Airplane Directorate

Aircraft Certification Service; Northwest Mountain Region
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Before: *Typical present day seating configuration at Type III emergency exit*



After: *Configuration per new Amdt. 25-76*



FAA issues New Type III Exit Rule

See article on page 11 . . .

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The purpose of The Designee Newsletter is to provide designees with the latest information concerning regulations, guidance material, policy and procedures changes, and personnel activities involving the certification work accomplished within the Transport Airplane Directorate's jurisdictional area. Although the information is the latest available at press time, it should not be considered "authority approved" unless specifically stated; neither does it replace any previously approved manuals, special conditions, alternative means, or other materials/documents. If you are in doubt about the status any of the information addressed, please contact your cognizant Aircraft Certification Office (ACO), Manufacturing Inspection District Office (MIDO), or other appropriate FAA office.

Views on Harmonization

The following is extracted from a speech given by Anthony J. Broderick, the FAA's Associate Administrator for Regulation and Certification, at the Flight Safety Foundation's 45th International Air Safety Seminar on November 4, 1992.

Recently I spoke with the chief executive of a European airline who said that his company spends upwards of \$2 million each time it leases a wide-body aircraft that has been in service in one of the largest American airlines, just for modifications required by his national civil aviation authority. Regrettably, this is not an isolated incident.

Tens of millions of dollars can be spent in testing and modifications required to obtain another country's certification of an aircraft that is already in international passenger service. Even for small business jets, the cost of additional countries' certifications can easily exceed \$1 million. Yet there is little, if any, practical benefit gained by multiple certifications among countries that have mature and competent civil aviation authorities.

The lack of international commonality in aviation safety regulations and their interpretation are inefficiencies which are very costly. This lack of common standards creates costs not only to airlines and manufacturers, but to consumers, who eventually pay them, one way or the other, and to civil aviation regulators, who expend scarce personnel and resources with no resulting gain in safety.

The recognition that something needed to be done... dates back to the early 1970's in Europe when, driven by common

commercial interests rooted in the Concorde and Airbus programs, an informal "arrangement" was conceived and executed among a number of European nations. This aviation alliance has grown to include 19 European countries.

In addition, since the early 1980's, increasingly intensive efforts have been undertaken to eliminate differences between the JAA [*Joint Airworthiness Authorities*] regulations and those of the FAA. Initially, these efforts focused exclusively on aircraft certification requirements. In the last few years, however, the importance of harmonizing maintenance and operating rules has also been recognized.

While we have taken positive steps toward harmonization, they are neither sufficient nor adequate, given the rapid internationalization of our industry. As a practical reality, however, we cannot wave a magic wand and make all the differences go away. Sovereignty remains alive and well even in our increasingly interdependent world. Each country has its own laws and its own procedures with which each authority is required to comply...

We have some real challenges ahead of us in this harmonization effort, challenges that many do not yet acknowledge. I believe that we need to put some of our best talent together to find better ways of addressing these issues. Every day that we shrink from this responsibility, hundreds of thousands of dollars are wasted in the name of, but not the achievement of, aviation safety, and diverted from addressing other vital safety issues.

Let me give you an example of the challenge we face.

A few weeks ago, I was astounded to learn, by reading in an aviation publication, that the JAA Flight Crew Licensing Working Group had decided to propose a harmonization of European commercial flight crew licensing requirements which would permit one pilot in a multi-pilot commercial air transport operation to fly until age 65 if the other pilot was under 60. While I am mindful that their deliberations must have included much technical data supporting this proposal, I am unaware of its widespread availability, and have not seen it.

"...if harmonization is to work, it takes time and a substantial and personal commitment by all parties to fashion a viable process."

Even worse, however, as I understand the proposal, the JAA would impose an age limit on pilots in all commercial commuter and air taxi operations. In the United States, and many other countries, we have never had such a rule. I have not seen, nor even heard about, a safety rationale for imposing one.

Let me be the first to admit that the "Age 60" rule has provoked controversy and has been the subject of much debate and legal skirmishing for several decades. In fact, following the ICAO [International Civil Aviation Organization] debate in the 28th Assembly, we in FAA initiated a \$2 million study of accident rates as a function of age, which is nearly complete. We will gladly provide this study to the international community for use in reconsideration of the "Age 60" rule.

However, at present, the "Age 60" rule remains an accepted international standard, and one which the U.S. and many other nations enforce rigorously. Not only is it a safety regulation, but changes in this rule can have major financial implications for airlines. With this work rule, without contract changes in union agreements, the largest U.S. airlines might expect cost increases by the tens of millions of dollars.

I use the "Age 60" rule only as an example of the difficulties we face in achieving harmonization of aviation safety rules, and not as a comment on the merits of the specific proposal. The problem here is that we have seen a large effort go into the development of a new regulatory scheme on one side of the Atlantic, and only a few of the affected parties were invited to participate. I would be the first to admit that this parochialism can be a shared condition. I am reminded of the experience not too many years ago when some proposed changes in the application of the FAA's foreign repair station certification regulations failed to reflect the concerns of numerous JAA countries.

...[T]he many difficulties being encountered in the harmonization of European rules, as well as the harmonization of European and U.S. rules, preclude the active participation of other states in these activities. I submit, in fact, that these very difficulties underscore the need for closer and earlier collaboration.

The experience to date has demonstrated that, if harmonization is to work, it takes time and a substantial and personal commitment by all parties to fashion a viable process. It has also shown that, to be effective, it requires not only careful consideration of what is technologically, politically, and legally feasible at a given point in time, but a vision for the future.

The question remains, however. . .

How do we foster a faster pace of harmonization that will meet the needs of our increasingly global industry?

I want to be modest in my predictions for the future, as I was reminded by an economist at the FAA that the reason forecasters were invented was to make astrologers look good. I do not claim to have the answers, but let me offer four ground rules for fostering aviation safety harmonization.

First, we must resist the temptation to "reinvent the wheel" if we are to succeed in harmonization:

The eagerness of the JAA to strike off on its own, using neither proven British Civil Aviation Regulations, nor equally well-established Federal Aviation Regulations, as the basis for common Joint Aviation Regulations, but electing instead to create new documents incorporating their view of the best of all present knowledge is a good example of this issue. These new rules have no history of use or interpretation in the way they are to be applied.

Does anyone who has worked on a team effort believe that the best way to move forward is to have half the team agree on a course of action, and then call the other members in and try to convince them that the first half of the team was right? This is exactly what has been done in, for example, the Age 60 efforts and most other operating rules that JAA has written.

Second, we must work to accommodate the different administrative procedures we each work under in writing and revising safety regulations:

In our country, and many others, you simply cannot impose a new regulation unless the benefits of that regulation exceed its costs when viewed over a 15 or 20 year projection into the future. While there is general agreement on the merit of this approach, the JAA regulatory efforts too often seem driven by the imperatives of the EC [European Community] deadlines, keeping public debate on the costs and benefits of the regulations *de minimis* at the very best.

This seemingly minor bureaucratic difference leads to critical problems.

"In our country, and many others, you simply cannot impose a new regulation unless the benefits of that regulation exceed its costs. . ."

For example, even when we agree that the difference between two certification rules is minimal from the safety viewpoint, we in the U.S. are going to take the least expensive approach. I do not see acceptance of this by the JAA, and expect this to be a big stumbling block in the future. Where, for example, is the detailed analysis of the costs and benefits of the Age 60 rule changes that are proposed by JAA?

Third, we must avoid the fascinations of "the new and improved model" mentality:

This is particularly true if we are to harmonize our approach to certification rules for "derivative" models. The JAA has shown a propensity to impose later versions of certification rules on derivative aircraft, forcing manufacturers to change designs or perform tests required by "state of the art" regulations even if the existing -- and far less costly -- design has shown no service difficulty

in the area, and no substantial safety improvement can be expected.

This was particularly evident in the treatment of the Boeing 747-400 model a couple of years ago, when tens of millions of dollars of testing, design, and modification costs were imposed for reasons of regulatory choice but with no discernible safety benefit and absolutely no publicly disseminated benefit/cost analysis. This is, of course, the sovereign right of countries; yet it will continue to be exercised only at considerable cost to consumers, manufacturers, and regulators alike.

"But what is JAA? How do we talk to JAA, and how do we formally deal with it? In its current form, you cannot easily do either."

Finally, we need to harmonize not just certification regulations but operating rules.

The cost of an aircraft itself is, I am told, somewhere between 10 and 30 percent of the cost of providing airline service. Now I find it hard to imagine that the marginal cost of certifying that aircraft is more than a few percent of that. Therefore, I am led to conclude that the direct cost savings from optimizing the harmonizing certification rules is on the order of one tenth to one percent of airline costs.

In sharp contrast, there are myriad opportunities to save many times that amount by harmonizing operations and maintenance rules. Better transoceanic routings, reduced separation standards, better weather and winds aloft information to eliminate fuel tankering, streamlined flight simulator certification and training rules, common flight and rest time requirements, common

repair station requirements, and harmonized maintenance requirements each hold treasure chests of potential savings.

When I look to the future and hear talk of open skies and more liberal transport regimes, I see the lack of regulatory harmonization in these areas presenting significant stumbling blocks. Frankly speaking, I doubt that our political leaders will accept for long any arguments from us that our incompatible regulatory structures preclude the implementation of their new air transportation agreements.

Even if we rigorously apply these four ground rules, we still face a couple of major obstacles to harmonization:

First, JAA must decide what it wants to be. Simply put, I am somewhat at a loss as to how to best deal with JAA. JAA is not a political body, but an informal group that has some standing within other European bodies...[T]he EC likes JAA because it handles the details of many messy regulatory matters in which EC has and desires to develop no expertise; and I gather other non-EC countries like JAA because they have joined the arrangement.

But what is JAA? How do we talk to JAA, and how do we formally deal with it? In its current form, you cannot easily do either. It has no obvious set of appeal routes, and there does not appear to be a functioning legal mechanism to contest decisions it has made. Its Executive Board strives mightily to achieve consensus, but that is not easily done among the 6 members of the Board, let alone the 19 members of the arrangement.

I submit that JAA could become the beginning of a "European Civil Aviation Authority." JAA should evolve to become a body which can act quickly, and negotiate

technical agreements promptly which bind its members. It must become capable of enforcing its decisions. It must do so soon, unless it wants to become a mere executive instrument of another decision-making body designed, constructed, and implemented by the political leadership of the EC.

Second, we need a global cooperative mechanism for developing and updating common safety rules.

Now some would argue that ICAO has already been constituted for just that purpose, and I would agree that was the original intent of ICAO. . . ICAO is an extraordinarily important body which has played, and will continue to play, a key role in the development of international civil aviation.

However, for more than four decades, we have acknowledged that ICAO cannot effectively function as the world authority for aircraft certification regulations. It does not do so for operating rules, either. ICAO's limited budget, other work program priorities, its large non-technical membership, and its need to have geographic balance in all of its working committees and panels, seems to preclude its playing a leadership role in the development of a detailed and comprehensive international civil aviation code.

As a first step, I suggest we use the informal arrangement of the JAA as a model, and build upon it. This could involve an informal group in which 10 or so aviation states in the world -- representing Europe, the Americas, and Asia -- work together to identify and eliminate differences in the wording and interpretation of aviation safety rules. We would need to ensure that the actual working groups are small, lest they make no progress

and do so at the glacial pace we have become used to in formal international deliberations. But they have to be not only technical experts, but people who bring ideas and concerns from a cross-section of affected parties to the harmonization table. While I admit this is a somewhat radical idea, and needs much further discussion and work before it could be embraced even by many in FAA, I believe we need to break the old paradigms and think differently if we are to make progress in harmonization at a reasonable rate. . .

"I urge all who hear or read these remarks to rededicate their efforts to removing regulatory differences and achieving commonality."

Harmonization of civil aviation safety rules can no longer be a laudable goal. It must become a reality. Differences in regulations and their interpretation unrelated to ensuring safety...are intolerable and must be eliminated at all costs.

I urge all who hear or read these remarks to rededicate their efforts to removing regulatory differences and achieving commonality. To the extent that we achieve it, we will save consumers money, open up possibilities of more liberalized air transport regimes, and free-up expenditures that contribute nothing to safety to improve surveillance of real safety concerns, thus improving consumer confidence in the international aviation system.

Let me assure you that the FAA is committed to providing leadership and working cooperatively with other authorities and organizations to produce an orderly and consistent international regulatory system that has compatible rules and practices which facilitate improved safety and efficiency.



Test Pulse and Head Injury Criteria

The Transport Airplane Directorate has received several inquiries concerning the test pulse and head injury criteria (HIC) outlined in the Federal Aviation Regulations (FAR). The following information is intended to respond to questions of a general nature that have been posed.

Evaluating the impact pulse shape

The selection of a triangular pulse shape, as specified in the FAR, was based on a number of factors. Experimental results from fuselage impact tests, analysis of accident data, and parametric analysis of airframe responses to crash loads were some of the bases for selection of the pulse shape.

The pulse shape was not derived from a mathematically generated waveform that meets a sufficient number of conditions. Rather, the minimum conditions (G_p , onset time, and velocity) described for sled tests in the FAR are based on a substantial amount of research, testing, and analysis, which determined that a triangular pulse shape is the best method to evaluate airplane seat performance.

Some of the characteristics that distinguish a triangular pulse from other pulse shapes are:

Constant onset rate: The pulse rises linearly from the start of impact (T_0) to the peak G 's (T_p), with a constant onset rate. For example, the horizontal impact requirement for FAR Section 25.562 ("*Emergency Landing Dynamic Conditions*") has a minimum onset rate of 16/0.090 G/sec during the entire period between T_0 and T_p . Note that the

magnitude of the onset rate for a triangular shape pulse must be greater than zero.

Vertical symmetry of pulse shape: The pulse shape exhibits symmetry about the average value. Consider the ideal 16 G_p pulse of FAR Section 25.562. During the onset phase of the impact test, the sled acceleration (G_{sled}) would be greater than 8 G 's for greater than 0.045 seconds, or half the total onset period.

Narrow peak: Ideally, the shape of the pulse should have a distinct peak followed by a decreasing magnitude during the trailing half of the pulse.

Pulse duration: The minimum pulse shapes outlined in the FAR are isosceles triangles. Thus, the trailing edge of the pulse should have a constant decay rate as well as vertical symmetry, as described above.

Other pulse shapes, such as trapezoidal or irregular shapes, do not exhibit these characteristics. Indeed, there is an infinite number of pulse shapes that will meet some of these characteristics, but the triangular pulse is the selected shape specified in the FAR.

In order to meet the minimum pulse parameters, most often the required G_p will be exceeded and T_p will be less than the specified FAR values. The impact methods of different facilities will affect the shape of the pulse. Some differences from the ideal can be expected and are acceptable.

The procedure specified in Advisory Circular (AC) 25.562-1 ("*Dynamic Evaluation of Seat Restraint Systems and Occupant Protection on Transport Airplanes*") for evaluating pulse shapes was provided to assess pulses that meet the quantitative requirements (16 G_p, 44 ft/sec) of the FAR and that exhibit the qualitative characteristics described above. Due to the large number of inquiries regarding this method, the FAA is reviewing it for possible clarification.

Some engineering judgment is required for evaluating the pulse produced by the test facility. For this reason, the regulatory authority responsible for certification should be familiar with the test facility prior to conducting certification tests. In addition to inspecting equipment and procedures, the authority should request a test demonstration and examine the results. If problems exist in developing the proper pulse, the necessary adjustments should be made.

FAA specialists have evaluated demonstration tests at several facilities throughout the world. Although the pulse shape varied among facilities, most facilities were able to produce an acceptable representation of a triangular pulse. Specialists agreed that the triangular shape should be the target pulse and that adjustments to control the impact pulse were within the capability of each facility.

Seat manufacturers closely scrutinize the pulse shape produced at a facility. High onset rates, rounded or trapezoidal pulses, and irregular shapes are more severe tests. Hopefully, as more facilities gain experience in conducting airplane seat tests, the pulse shapes will become similar and consistent with the intent of the regulation.

If an acceptable pulse shape cannot be achieved using the above guidance, a more

precise mathematical definition could be developed. However, such a precise definition could be a burden to industry, especially if certain test facilities are unable to meet more stringent parameters or if repeated tests are required in order to comply with pulse analysis. Repeated tests should not be necessary if test facilities continue to develop the capability to produce impact pulse shapes reasonably close to those described in the AC.

Evaluating the HIC

The HIC evaluation should include any or all impulses developed during the initial airplane impact pulse. The calculation should include the portion of the pulse that produces the maximum HIC value.

When the head impact produces two peak accelerations within a very short time interval, and when it can be determined that a single blow to the head produces the irregular pulse, then the whole of the process should be considered, including all discrete impacts or peaks in the curve with time interval sampling taken over the whole extent. The FAA considers this to be the realistic accumulative effect on the head from the impact.

Evaluation of the HIC is not required if no head impact occurs during a dynamic seat test in which likely head strike objects are installed.

Evaluating flight crew seats

Currently, no floor warpage is required for assessing the HIC for either passengers or crew members. Floor warpage was included in the rule to ensure that the seat would remain attached to the airframe throughout the landing impact. Since floor warpage is likely to occur late in the impact, the FAA has

concluded that testing without floor warpage provides a more realistic scenario for assessing the HIC.

For this reason, seat manufacturers are asked to test all passenger and crew member seats for the most critical structural condition with floor warpage; these tests may be accomplished with no warpage when evaluating the HIC. In addition, the FAA has allowed, by exemption, the flight deck seats to be tested without floor warpage for both structural and injury assessment on airplanes with 40 inches or more of frangible structure below the pilot seats.

All adjustable seats must be tested in the most critical position for certification to the structural requirements of both FAR Section

25.561 ("*Emergency Landing Conditions, General*") and Section 25.562.

When evaluating the HIC, the pilot seats should be tested in the position normally occupied by the 50th percentile male.

Alternatively, tests may be conducted in the most critical structural configuration with all likely head strike objects relocated accordingly, which, in some cases, may reduce the number of tests required to show compliance with the regulations.

Additional Guidance for the installation of dynamically qualified seats is contained in Advisory Circular (AC) 25.562-1.



Finding Compliance with FAR 25.562

With the adoption of FAR Section 25.562, "*Emergency Landing Dynamic Conditions*," the concept of dynamic testing and performance measurements (head injury criteria, femur load, upper torso restraint loads, etc.) to determine the potential for occupant injury was introduced in the FAA regulations.

Finding compliance with FAR Section 25.562 will generally cover several technical disciplines -- at a minimum, structures and interior arrangements -- as well as technical areas not addressed currently in FAA Order 8110.37, "*Designated Engineering Representative (DER) Guidance Handbook*," such as structural analysis based on dynamic tests and head injury criteria.

Most currently-appointed structural DER's are authorized to approve static substantiation, as specified in FAA Order 8110.37, Figure 1, Chart A1, Delegated Function 1. Delegated Function 2, as set forth in that Order, applies to analytical substantiations (dynamic), which are intended to entail analysis of airplane structural loads. Neither Function 1 nor Function 2 covers dynamic seat testing.

At this time, the FAA is not aware of any DER's who have been authorized to find compliance with FAR Section 25.562. Due to the complexity of the test procedure and potential interface problems of the seat with the surrounding airplane interior (even when the seat has a TSO-C127 authorization), the

FAA considers that a special DER authorization under "H" in Chart A1 is necessary. Until the FAA issues such authorizations, a DER would need specific authorization from the Aircraft Certification Office (ACO) administering the project.

We encourage DER's to work with their cognizant ACO to obtain the knowledge and expertise necessary to find compliance with the new FAR Section 25.562 requirements.



FAA Issues Type III Exit Rule

In June 1992, the FAA issued

- » **Amendment 25-76** to Federal Aviation Regulations (FAR) Part 25 (*"Airworthiness Standards: Transport Category Airplanes"*);
- » **Amendment 121-228** to FAR Part 121 (*"Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of Large Aircraft"*); and
- » **Amendment 135-43** to FAR Part 135 (*"Air Taxi Operators and Commercial Operators"*)

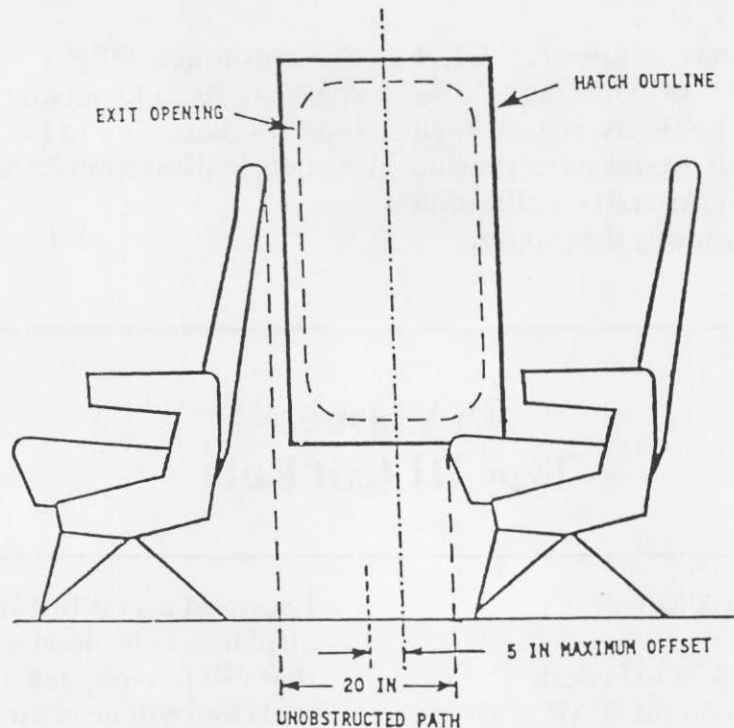
Each amendment relates to requirements for **Improved Access to Type III Exits**. In effect, these new requirements will make it easier for passengers on an airliner to reach emergency exits located over the plane's wings.

The rule is applicable to transport category airplanes and requires:

- **Improved access to Type III exits on airplanes to be developed in the future that will be equipped with 60 or more seats and will be in air carrier or commercial service; and**
- **Compliance with these new rules by December 3, 1992, for those airplane models that were type certificated after January 1, 1958, and that are currently in airline service.**

A Type III exit is 20" x 36" high (minimum) with a maximum step-up of 20 inches from the floor to the bottom sill of the exit and a maximum step-down from the bottom sill to the wing of not more than 27 inches. Type III exits are located typically over the wings on standard or narrow-body fuselages such as on Boeing Model 727 and 737 series airplanes, McDonnell Douglas Model DC-9 series airplanes, and Airbus Industrie Model A320 series airplanes.

The new rule provides for two alternative methods (design changes) of improving access to Type III exits for airplanes with 60 or more seats:



This illustrates one alternative design for complying with the requirements of the new rule: For an airplane equipped with triple seats, there must be a 20-inch passageway with offsets no greater than 5 inches.

(1) provide a 20-inch passageway in which the difference between the center line of the exit and the center line of the passageway is no greater than 5 inches (an "offset") for airplanes with triple seats, or a 10-inch passageway with a 5-inch offset for airplanes with double seats; or

(2) remove the outboard seat place and provide two 6-inch passageways.

The FAA based the content of these rules on findings from three series of mini-evacuation tests performed at the Civil Aeromedical Institute (CAMI). These tests, in which a total of 131 people repeatedly exited through over-wing exits, showed that improved access rates could be achieved by defining minimum passageway widths.

Another recent set of CAMI tests revealed that a 13-inch passageway with a 6.5-inch

offset provided an equivalent level of safety to the 20-inch passageway for airplanes with triple seats. Several airlines have requested, and have been granted, equivalent level of safety findings under the provisions of FAR Section 21.21(b)(1), using this CAMI data as a basis for their request. The FAA is currently planning to propose an amendment to the rule that will incorporate this latest test data.

The new rule does provide for the FAA approval of deviations from the design requirements and the compliance time if special circumstances warrant it. Since issuance of these rules, approximately 40 air carriers have requested such deviations. In response to these requests, the Transport Airplane Directorate has granted relief to numerous U.S. air carriers, including compliance time extensions of up to one year for accomplishing the modification.



Electrical Wiring Used in Commercial Transport Airplanes

The FAA does not require that a specific brand of electrical wire or type of wire insulation design/construction be used in commercial aircraft. Aircraft manufacturers perform tests and evaluations, and select the best wire for their applications and installations.

The Federal Aviation Regulations (FAR) require that specific burn tests for aircraft wiring be conducted in order to meet a minimum fire safety standard; but beyond that, no specific requirements exist for toxicity, flammability, or arc-tracking (notch propagation).

Recently, the Transport Airplane Directorate received requests for guidance concerning the use certain types of wiring, namely **Kapton** and **Raychem 55A**. Kapton is a trademark name of Dupont; Dupont uses the term "Kapton" as a marketing name for a particular wire construction, technically referred to as *aromatic polyimide*. Raychem 55A is a trade name for *irradiated fluoropolymer*. Kapton has been available and widely used for the past twenty-five years and is the more established insulant; Raychem 55A is a relative newcomer.

Specific questions raised concerning these types of electrical wiring include:

- **QUESTION #1:** Is the FAA aware of a change made by aircraft manufacturers from Raychem to Kapton wire? If so, please provide FAA's understanding as to why the change was made. For

example, was the change due to a safety concern or for other reasons?

FAA RESPONSE: The FAA is not aware of an industry switch from Raychem wire to Kapton wire. Aircraft manufacturers are continuously seeking improved performance in all aspects of aircraft design, including wire insulants. Knowing that numerous wire manufacturers supply aircraft grade wire that meets military specifications to aircraft manufacturers, the FAA does not require that aircraft manufacturers purchase wire from a particular source. As improved wire insulant materials are developed, the FAA expects to see aircraft manufacturers using such higher-performance insulants. With regard to the civil aircraft fleet, the FAA is not aware of any safety (or other) concerns that might have caused the purported change from Raychem to Kapton wire.

- **QUESTION #2:** Has the FAA found any evidence that faulty or defective wiring contributed to aircraft accidents or incidents since 1980? If so, please provide specifics concerning the date of the accident/incident and the type of wire involved.

FAA RESPONSE: Many incidents occur each year in which **electrical components** are involved. Fortunately, most of these incidents are minor and are the result of electrical components that are unrelated to the aircraft wire itself. In two of these incidents (one in 1986 involving a TWA Model L-1011, and another in 1985 involving

a Monarch Airlines Model B-757), Kapton wire was found to be improperly hot-stamped and the wire failed, causing wire bundle failures.

Because aromatic polyimide has **not** been a factor in any commercial aviation **accident**, the FAA has had no reason to issue an airworthiness directive (AD) to prevent the use of aromatic polyimide or irradiated fluoropolymer insulated wire. A number of incidents have occurred in which wires failed as a result of structural chafing, electrical component failure, or unrelenting resetting of circuit breakers. In such cases, however, most types of wire insulation can be expected to fail -- not just aromatic polyimides or irradiated fluoropolymers. Finally, the FAA is unaware of any evidence that defective wire **insulation** has caused or contributed to any commercial aircraft accidents or deaths.

Considering the total amount of wire in the fleet and the number of years these aircraft have been operating, the performance of wire insulation in civil transport aircraft has been exemplary. These types of wire have been in use on most large commercial airliners in the United States and Europe for many years, and have contributed to the achievement of tens of millions of hours of safe flight.

- **QUESTION #3 :** Does the FAA routinely assess aircraft wiring as part of its maintenance inspection program and accident/incident investigations? If so, please explain how this is done.

FAA RESPONSE: The FAA approves and monitors the maintenance programs of airlines, which include wiring inspections. During the maintenance program's scheduled inspections, the wiring is inspected by airline maintenance inspectors. In addition, FAA avionics inspectors participate

in post accident/incident investigations, providing assistance to the National Transportation Safety Board (NTSB) when requested.

- **QUESTION #4 :** Does the Department of Defense (DOD) share aircraft wiring test results with the FAA? If so, how is this done?

FAA RESPONSE: The FAA works very closely with the Air Force to foster the sharing of information regarding wire test results. Members of the FAA have participated in meetings with the military organizations. The DOD evaluations of aircraft electrical wire insulation systems are widely promulgated, and the FAA is made aware of the results by attending debriefing seminars, etc. (For example, the Air Force's debriefing on its two-year study of aircraft wire insulations was held in St. Louis on April 15, 1991; the FAA was represented at that debriefing by FAA Technical Center personnel.) The FAA also receives copies of DOD publications, test reports, etc., and participates in industry forums at which DOD is also represented, such as those under the aegis of the Society of Automotive Engineers, the American Society of Testing and Materials, and Aeronautical Radio Inc.

- **QUESTION #5 :** Has the FAA independently tested Kapton or Raychem wire to assess the arc propagation problem caused by chafing due to heavy aircraft vibrations? If so, when were the tests performed and what conclusions were reached?

FAA RESPONSE: The FAA Technical Center has been involved in testing, and has issued FAA Technical Center Report DOT/FAA/ CT-88-4, "Aircraft Electrical

Wet-Wire Arc-Tracking," dated August 1988. The conclusions include the following:

- » Certain polyimide- fluoropolymer constructions can resist wet-wire arc tracking.
- » The conductivity of the electrolyte may influence the type of event (tracking-open) and the time in which this event occurs.
- » Thermogravimetric analysis data can provide valuable information concerning the tendency of a polymer to form a char residue in an oxidative or nonoxidative environment.
- » Resetting circuit breakers can result in increasingly severe failures of the wire bundle due to the additional arcing.

- **QUESTION #6: Has FAA participated in any tests of Raychem and Kapton aircraft wiring with industry or DOD? If so, when were the tests performed and what conclusions were reached?**

FAA RESPONSE: The FAA participated jointly with the DOD and industry in a two-year wire evaluation program. Testing was completed in early 1991. The results showed that a hybrid construction of Teflon/Kapton/Teflon (TKT) exhibited outstanding overall performance.

- **QUESTION #7: What is the FAA's justification for allowing Kapton wire to be used in commercial aircraft when the Army and Navy have decided not to use this wire in military aircraft?**

FAA RESPONSE: The FAA is influenced in its positions by the evidence of analytical and empirical data and, most strongly, by the extensive in-service performance of the materials in day-to-day use in the **commercial** aircraft fleets around the world.

Since its introduction over 25 years ago, Kapton has been used by such manufacturers as Boeing, McDonnell Douglas, British Aerospace, Lockheed, Airbus, Fokker, etc.; thus, it is no exaggeration to say that there are millions of feet of electrical wire insulated with Kapton flying millions of miles per year with a problem/incidence level close to non-existent. The FAA has not identified an unsafe condition associated with the use of Kapton and has no justification for limiting its use in transport category airplanes.

The FAA acknowledges the decisions made by the Army, Navy, and Air Force, but does not support nor disclaim the results of their studies. The operating environment (moisture, salt spray, G-forces, etc.) and specific mission requirements differ significantly between commercial aircraft and military aircraft. As a result, the FAA's experience with aromatic polyimides is not necessarily commensurate with that of the military.

There is no perfect or ideal wire insulating material. Each type of wire insulation/construction has its own merits and its own shortcomings. When aircraft wiring installations are designed, engineers must take into consideration the wire's characteristics and limitations. As technology moves forward, the FAA expects to see improvements in insulant performance, but these newer wire insulations also most likely have limitations.

• **QUESTION #8 : Does the FAA have wire and cable experts or other sufficiently trained staff who can:**

- (1) ensure that aircraft wire meets required safety standards,
- (2) assess the condition of wire when aircraft undergo maintenance, and
- (3) determine the extent to which faulty or defective wiring contributed to an accident/incident?

If so, how many experts or specialists does FAA employ in each of these capacities, how long have they been employed, and what qualifications do they have for evaluating aircraft wiring?

FAA RESPONSE: The FAA employs many technically trained and oriented aircraft manufacturing and quality control technicians and engineers, with experience ranging from a few years to over twenty years.

These employees possess varying levels of training and education, ranging from the technician level to those with Bachelors of Science degrees in Electrical Engineering (BSEE), Master of Science degrees, and Doctorates in the physical sciences.

The FAA's Flight Standards District Offices (FSDO) employ maintenance specialists who monitor the maintenance programs of the airlines.

As stated earlier, the FAA does not become involved directly in engineering new wire

insulations or construction types and, therefore, does not have a need to analyze the quantum physics of aromatic polyimide or irradiated fluoropolymer materials. As with other aspects of aircraft certification, the FAA relies upon other sources for information and assistance.

When one considers the FAA's ability to augment its technical staff with members of academia and industry, the FAA has tremendous resources available at hand. Designated Engineering Representatives (DER), appointed by the FAA Administrator, are employed by the manufacturers, but are designated to perform certification functions for the FAA.

Expertise within the FAA Aircraft Certification organization lies in establishing requirements and ensuring that aircraft designs meet those standards. The FAA does not mandate the manner in which the certification criteria are met.

The function of the FAA Flight Standards organization is more closely directed to inspection of the fleet. It is difficult to determine the number of experts available, but there are approximately 16 to 18 engineers in the FAA's Certification Directorates and Aircraft Certification Offices, 4 at the FAA Technical Center, and perhaps 25 more at manufacturing sites.

There are also many specialists in the FSDO's, with each office employing avionics inspectors who monitor the airlines' maintenance programs.



Baggage Compartment Liner Requirements of FAR Section 121.314

The Transport Airplane Directorate has received a request for guidance concerning the cargo and baggage compartment liner requirements of Federal Aviation Regulations (FAR) Section 121.314, "Cargo and Baggage Compartments." The following information may be of general interest to readers.

FAR Part 121 ("*Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of Large Aircraft*") was amended by Amendment 121-202 to require that each Class C or D cargo or baggage compartment greater than 200 cubic feet in volume, and installed in a transport category airplane, must have ceiling and sidewall liner panels constructed of:

- glass-fiber reinforced resin;
- materials that meet the test requirements of Part 25, Appendix F, part III; or
- aluminum, in the case of liner installations approved prior to March 20, 1989.

FAR Section 135.169(d) ("*Air Taxi Operators and Commercial Operators -- Additional Airworthiness Requirements*") also contains the same requirements for transport category airplanes operated under the provisions of Part 135.

FAR Sections 121.314 and 135.169(d) require compliance after March 20, 1991; however, a number of exemptions were granted to extend the compliance time:

Apart from extensions to dates that have already passed (and are therefore no longer relevant), Exemption 5288 extended compliance for liner detail features to September 20, 1992, for McDonnell Douglas Model DC-10 airplanes; and to March 20, 1993, for Boeing Model 727, 747, 757 and 767 airplanes, and Airbus Model A300 and A310 airplanes.

In addition, Exemption 5288B extended the compliance time for repairs of liners and repairs of liner detail features to October 20, 1992.

The phrase, "*liner detail features*," as used in these exemptions, refers to any design features, such as fasteners, lighting lenses, ducting, etc., the failure of which would affect the capability of the liner to safely contain a fire.

Actually, references to "*approved liner repairs*" are inaccurate since it is the liner with the repair incorporated that must be approved, and not the repair per se. When a repair method is described as being "*FAA approved*," what is actually meant is that a liner construction that meets the criteria of FAR Sections 121.314 and 135.169(d) and has been repaired using that repair method,

is FAA approved. Obviously, there is no requirement for a repaired liner or repaired liner detail feature to meet the new criteria earlier than if it were undamaged.

In summary, compliance of all transport category airplanes operated under the provisions of Part 121 or Part 135 is required as follows:

(1) The basic liner construction of all airplane models must already comply.

(2) Liner detail features of McDonnell Douglas Model DC-10 airplanes must comply after September 20, 1992; and those of Boeing Model 727, 747, 757 and 767, and Airbus Model A300 and A310 airplanes, must comply after March 20, 1993.

(3) Liner detail features of all other airplanes must already comply.

(4) Repaired liners of all models must comply after October 20, 1992.

(5) Repaired liner detail features of the above Boeing and Airbus airplanes must comply after March 20, 1993; and repaired liner detail features of all other airplanes must comply after October 20, 1992.

The FAA acknowledges that there has also been some confusion between the requirements for type certification of liners, and the requirements specifically of FAR Sections 121.314 and 135.169(a).

The following may serve to clarify this subject:

- Any replacement liner must be shown to comply with the regulations incorporated by reference in the type certificate for the airplane model involved.

- For most transport category airplanes currently in service, the regulations incorporated by reference are contained in Part 25 in effect prior to Amendment 25-60 when the test requirements of Appendix F, Part III, were adopted.

For those airplanes, compliance with the earlier liner test requirements in effect prior to Amendment 25-60 is required for type certification.

- If the liner is of glass-fiber reinforced resin construction, no further testing is required because, insofar as Parts 121 and 135 are concerned, liners of that construction are satisfactory by definition.
- If the liner is of some construction other than glass-fiber reinforced resin, it must also comply with the test requirements of Part 25, Appendix F, Part III.
- Future transport category airplanes with a type certification basis of Part 25 as amended by Amendment 25-60 will, of course, have to meet the test requirements of Appendix F, part III, for type certification, regardless of the liner construction used.



Current Nondestructive Inspection Methods for Aging Aircraft

An increased demand for commercial aircraft has forced air carriers to operate existing aircraft beyond their original economic design life. Consequently, the average age of the U.S. commercial fleet has risen steadily from 4.6 years in 1970 to 12.7 years in 1989. If this trend is maintained, 60% of the current fleet will exceed their economic design life by the end of this decade.

Chronological age alone may not reflect the condition of the airplane structure. The number of flights, the cumulative flight time, environmental exposure, and usage patterns also play a role. Together, however, these factors tend to correlate well with chronological age, and structural problems such as fatigue cracking, corrosion, and disbonding are more likely to be encountered in high-time aircraft.

Prior to 1978, the FAA maintained that aircraft structure be designed according to fail-safe requirements. This required that sufficient redundancy be designed into an aircraft structure such that if a major structural element were to fail, the surrounding structure would safely bear the additional load.

Since that time, the fail-safe design requirement has been augmented by damage tolerance criteria.

Damage tolerance maintains that an aircraft remain airworthy despite the possibility of containing subcritical cracks and flaws. This

philosophy recognizes the impossibility of establishing complete structural redundancy throughout the aircraft. Accordingly, continued airworthiness of damage tolerant aircraft strongly depends upon the implementation of inspection programs capable of detecting cracks and flaws prior to reaching their critical size.

To further strengthen the maintenance and inspection procedures required to meet damage tolerance criteria, the FAA issued Advisory Circular (AC) 91-56 in 1981. This AC provides aircraft manufacturers and operators with guidelines for establishing Supplemental Structural Inspection Documents (SSID). Through the SSID programs, aircraft that were originally designed fail-safe are essentially brought into conformance with the damage tolerance philosophy by means of updated inspection programs.

Because of the additional number of inspections directed by the SSID programs, there has been an increased emphasis placed upon the importance of nondestructive inspection (NDI). The importance of NDI stems from its ability to determine structural integrity with minimal aircraft tear-down, disassembly, downtime, and loss of revenue.

In June 1992, the FAA's Technical Center released Report No. DOT/FAA/CT-91/5, "*Current Nondestructive Inspection Methods for Aging Aircraft*." This report identifies and describes current methods used at aircraft maintenance facilities during the

nondestructive inspection of commercial transport aircraft for structural damage. The six most prevalent NDI methods identified are visual, eddy current, radiography, ultrasonic, penetrant, and magnetic particle.

Visual

Visual inspection is the most common form of NDI and consists of viewing the area by the eye, with or without the aid of a magnifying glass, borescope, light source, etc.

Eddy Current

Eddy current inspection is used to detect surface or near-surface cracks in metals, to detect thinning of metals due to corrosion, and to sort metals or alloys and their heat treat conditions. *High frequency eddy current inspection* techniques can be applied to airplane parts or assemblies where the defective area is accessible to contact by the eddy current probe. *Low frequency eddy current inspection* techniques are used to detect cracks or corrosion on back surfaces or cracks in underlying structure. The inspection is performed by inducing eddy currents into a part and electronically observing variations in the induced field.

Radiographic

Radiographic inspection will show internal and external structural details of all types of parts and materials. It is usually used for the inspection of inaccessible areas in the airframe structure or thick sections which do not lend themselves to inspection through other NDI methods. It is accomplished by transmitting an x-ray or gamma-ray beam through the part or assembly being tested. The transmitted beam impinges on radiographic film or detector, and reveals anomalies. The structural details of the part

or assembly will be shown by variations in density on film or a video display. Interpretation of the radiograph will indicate defects.

Ultrasonic

Ultrasonic inspection is suitable for the inspection of most metals, plastics, and composites, for surface or subsurface defects. Ultrasonic inspection requires at least one surface of the part to be accessible in the vicinity of the area being inspected. The inspection of aircraft structure is accomplished by inducing ultrasonic waves into the part and picking up reflections of this sound from within the part. The detected ultrasonic reflections are electronically displayed on an oscilloscope for interpretation by the inspector.

Penetrant

Penetrant inspection is used to detect small cracks or discontinuities open to the surface that are not evident by normal visual inspection. Penetrant inspection can be used on most aircraft parts and assemblies accessible for its application. The inspection is performed by applying a liquid that penetrates into surface defects. Excessive penetrant is then removed from the surface and suitable developers are applied to draw the remaining penetrant from the defects. Visual indications at the surface are obtained by using fluorescent or dye-colored penetrants.

Magnetic Particle

Magnetic particle inspection will indicate surface or subsurface defects in ferromagnetic parts. It may be performed on assembled or disassembled parts. The test is accomplished by inducing an electromagnetic field in the part and applying

a dry powder or liquid suspension of fluorescent or colored iron oxide particles. Local magnetic poles formed by defects in the part will attract the particles and indicate areas of discontinuities.

The report describes the principles underlying each method of inspection, as well as the types of defects sought by the method and a listing of particular performance characteristics associated with that method.

The report also describes the physical principles, generalized performance charac-

teristics, and typical applications associated with each method, and compares the advantages and disadvantages of each inspection method.

In addition, descriptions of specific airframe and engine inspection practices are presented.

Copies of this report can be obtained from the National Technical Information Service, Springfield, Virginia 22161.



Aircraft Certification Systems Evaluation Program (ACSEP)

The FAA is launching a new program to boost the quality of aircraft parts, increase safety, and keep the United States aviation industry a global leader.

The Aircraft Certification Systems Evaluation Program (ACSEP) is part of the Aircraft Certification Service's program for continued operational safety, including system surveillance, and promotion of universal compliance with FAA regulations and policy. It applies comprehensive standardized criteria to evaluate the system by which design and production approval holders produce products.

The ACSEP ascertains whether design and production approval holders, and their

priority part suppliers, are meeting the requirements of the Federal Aviation Regulations (FAR) and complying with the procedures established to meet the requirements of the FARs. Emphasis is placed on the continued integrity of design data, subsequent to initial approval by the FAA (or FAA designated representative), and verification that products and parts conform to FAA approved data.

Craig Beard, Director of the FAA's Aircraft Certification Service, recently stated:

"... ACSEP is part of the service's number one priority -- continued operational safety. It will have a significant impact on aircraft certification in the near future."

The ACSEP program concept was jointly developed by the FAA's Aircraft Engineering Division and the Aircraft Manufacturing Division (both located in FAA Headquarters in Washington, D.C.), working with industry, and the FAA Directorates.

Together with industry representatives, the FAA's four Directorates have come up with criteria for all evaluations. Six major systems have been identified as common to all manufacturers. These are broken down into 18 subsystems for conducting efficient evaluations.

Areas where cooperation between government and industry are an integral part of the new implemented program include:

- **Industry input.**

Cooperation with industry began during the program's design. Approximately 85% of the evaluation criteria were proposed by industry. The program also encourages manufacturing facilities to provide feedback after each evaluation.

- **Positive comments**

FAA evaluators are encouraged to report any positive observations uncovered during evaluations. Manufacturers are required, of course, to take corrective action on nonconformance findings.

- **Team approach**

Aviation safety inspectors, engineers, flight test pilots, principal inspectors, and project engineers will be involved in the evaluations. This allows each team member to draw on the experience and expertise of others.

This new way of ensuring regulatory compliance goes far beyond typical auditing practices. It provides the FAA with opportunities to evaluate established practices and new technologies.

The data gathered will assist in timely, responsive regulatory and policy deployment. This is accomplished by increasing the compliance partnership with industry and driving out the fear associated with the "audit."

From this data, the FAA will have the capability to detect shifts in performance and statistically significant trends for the industry as a whole and/or for different segments of the industry.

Critical to the effectiveness of the program is the continuous improvement process where evaluation data is put into a national database to predict future trends.

"The service-wide status of ACSEP will ensure the collection of evaluation data for use in improving various aspects of the certification management process," said Beard.

The program entailed two years to develop. Twenty-one FAA engineers and aviation safety inspectors from across the country recently completed the first training course in ACSEP procedures. As soon as the course ended, the group began conducting evaluations at U.S.-based aviation manufacturing facilities, including Bell Helicopter, Honeywell, and MRC Bearing.

During the next year, 250 Aircraft Certification employees, including flight test pilots, will be trained to implement this new program.



Aviation Research Grants

Satellite technology, aircraft skin corrosion fatigue and fracture analysis, engine ingestion, airborne hazards, explosives detection, human factors in air traffic control -- what do these FAA programs have in common? For one thing, more is being learned about them through the agency's new *"Aviation Research Grants Program."*

Details of the administrative process related to this research grant program have been compiled in FAA Order 9550.7, *"Research Grants Handbook,"* issued April 8, 1992.

So far, the FAA has received 68 grant proposals from institutions across the nation and Canada. Several million dollars in funds have already been awarded.

Why grants? This is the first year for the agency's aviation research grants and centers of excellence programs, managed by the FAA Technical Center's Office of Research and Technology Applications, ACL.

Considered the most effective and flexible way to acquire basic and applied research from academia, grants can channel up-to-the-minute research and technology to the agency from colleges, universities, and research institutions.

Knowledge gained in the process spills over to other agency research engineering and to developmental programs where it provides insight for the future.

Legislative mandates. Under the Federal Aviation Act of 1958, which established the

FAA, the agency had no authority to award research grants. In 1990, two statutes created grant programs:

Omnibus Budget Reconciliation Act (Public Law 101-508)

This program was enacted to enhance the FAA's access to resources and research facilities available at colleges, universities, and other non-profit research institutions. It authorizes the FAA to establish research grant programs that encompass a broad spectrum of aviation research activities and *"Centers of Excellence"* (described later) that are targeted at specific areas of long-term aviation research. These programs encourage and support innovative, advanced research of potential benefit to the FAA mission. By encouraging academic institutions to establish aviation research programs, and by expanding the role these institutions play in aviation research, the FAA will nurture the long-term growth of the aviation industry. This Act requires the FAA to seek proposals from historically black and other minority academic institutions and to provide an equitable geographic distribution of awards.

Aviation Security Improvement Act (Public Law 101-604)

This program was enacted as a response to the report issued by the President's Commission on Aviation Security and Terrorism. This law authorizes the creation of a grants program to accelerate and expand the research, development, and implemen-

tation of technologies and procedures to counteract terrorist acts against civil aviation.

Public Laws 101-508 and 101-604 authorize three separate grant programs:

Aviation Research Grant Program (Public Law 101-508, Section 9205): Grants under this program are awarded for the conduct of research for the long-term growth of civil aviation. Research topics may include, but are not restricted to, air traffic control automation, aviation applications of artificial intelligence, aviation training technologies and techniques, human factors in highly automated environments, and aircraft safety. Grants may be made to colleges, universities, and non-profit research organizations.

Catastrophic Failure Prevention Research Grant Program (Public Law 101-508, Section 9208): Grants under this program are awarded for the conduct of research relating to the development of technologies and methods to assess the risk and prevent defects, failures, and malfunctions of products, parts, processes, and articles manufactured for use in aircraft, aircraft engines, propellers, and appliances which could result in a catastrophic failure of an aircraft. This program also contains authority for the establishment of Centers of Excellence. Grants may be made to colleges, universities, and non-profit research organizations.

Aviation Security Grant Program (Public Law 101-604, Section 107) Grants under this program are to be awarded for the conduct of research, development, and implementation of technologies and procedures to counteract terrorist acts against civil aviation. Grants

may be awarded to colleges, universities, and other appropriate research institutions and facilities with demonstrated ability to conduct research in technologies and procedures to counteract terrorist acts against civil aviation. The FAA may also enter into cooperative agreements with such governmental entities as considered appropriate by the FAA.

Public Law 101-508 also establishes two programs for "*Centers of Excellence*":

Catastrophic Failure Prevention Centers of Excellence (Public Law 101-508, Section 9208) are established in those institutions eligible for grants under the Catastrophic Failure Prevention Grant Program for the purpose of continuing research in the identified area.

Aviation Research Centers of Excellence (Public Law 101-508, Section 9209) are to be responsible for the conduct of research concerning airspace and airport planning and design, airport capacity enhancement techniques, human performance in the air transportation environment, aviation safety and security, the supply of trained air transportation personnel including pilots and mechanics, and other aviation issues pertinent to developing and maintaining a safe and efficient air transportation system, and the interpretation, publication, and dissemination of the results of such research.

FAA Mechanism for Generating Grant Proposals. The primary mechanism used by the FAA to generate solicited proposals is the publication of a "*Notice of Solicitation*" in the Federal Register at least annually. The notice describes the areas in which the FAA

wishes to award grants, identifies the effective term of the notice, addresses the eligibility and evaluation criteria, and provides proposal submission guidelines. The FAA may also provide notice by direct mailing of solicitation brochures.

Grants currently underway. The FAA's Engineering, Research, and Development Service (ACD) at the FAA Technical Center is currently sponsoring two research grants that relate to the use of water sprays in aircraft cabin fires and the ingestion of rain and hail mixtures in to engines. Other ACD-sponsored programs range from corrosion fatigue of airframe materials to human performance factors.

Bruce Singer, ACD Deputy Director, recently said:

"The research grants program provides with an ideal vehicle to have universities conduct research in broad areas of interest to the agency. The research supports our safety and system enhancement activities. It is a particularly effective way to conduct the long-range research committed to in the Aviation Safety Act of 1988."

The FAA's Aviation Security Research and Development Service (ACA), also located at the FAA Technical Center, is sponsoring a grant for selective surfaces for explosives detection.

As Paul Polski, Director of ACA, recently commented:

"The research grants program is the perfect way to have access to front-end research in aviation security."

One of the research grants sponsored by the FAA's Research and Development Service (ARD), located at FAA Headquarters in Washington, D.C., concerns the development of integrated systems for resolving hazard alerts in future air traffic control operations.

Steve Zaidman, Director of ARD says that the Research Grants Program has worked out extremely well, exceeding expectations. Says Zaidman:

"It's a terrific way to supplement contractual access to research. I'm very satisfied with the research grants process and hope the funding will support our research efforts. I'm looking forward to the results."

For more information on the Research Grants Program or to obtain forms used in the program, contact:

**Office of Research and
Technology Applications, ACL-1
Federal Aviation Administration
Technical Center
Atlantic City International Airport,
New Jersey 08405**



Technical Standard Orders (TSO)

The following information concerns recently issued and proposed TSO's for which Designees may have an interest:

TSO-C129, "Airborne Supplemental Navigation Equipment Using the Global Positioning System." The FAA issued TSO-C129 on December 10, 1992, which prescribes the minimum performance standard that airborne supplemental area navigation equipment using the global positioning system (GPS) must meet in order to be identified with the TSO marking. Such equipment that is to be SO ntified and that is manufactured on or after the issue date of this TSO must meet the minimum performance standards of Section 2 of RTCA Document No. RTCA/DO-208, *"Minimum Operational Performance Standards for Airborne Supplemental Navigation Equipment Using Global Positioning System,"* dated July 1991.

This extensive and highly complex TSO has been a major project for industry, the FAA, and various committees worldwide.

The Global Positioning System (GPS) is an all-weather navigation system developed by the U.S. Department of Defense (DOD) over the last 17 years. When complete, GPS will consist of a constellation of 21 satellites configured in 6 orbital planes.

The GPS satellite constellation currently is controlled by DOD and is not dedicated to civilian use at this time. Users of GPS are cautioned that the system is not yet fully

operational and that signal availability and accuracy are subject to change due to an incomplete satellite constellation and operational test activities. Agreements between DOD and the Department of Transportation that will define the levels of service to be provided to civilian uses have not been finalized.

When it is completed and available to everyone, GPS will provide highly accurate position and velocity information in three dimensions, as well as precise time, to users everywhere in the world 24 hours a day. GPS positions are calculated using the basic principle of triangulation; a highly accurate time source is essential to the operation of the system. Horizontal position accuracy of 100 meters and vertical accuracy of 150 meters is possible. Supplemental ground facilities potentially could increase this accuracy almost tenfold.

GPS transmits two pseudo-range code signals and operates at two frequencies L1 (1575.42 Mhz) and L2 (1227.6 MHz): P for precision, and C/A for course/acquisition. The P-code is encrypted for national security reasons and available only to cleared users, while the C/A code is available to all users. A GPS receiver determines three-dimensional position and time by ranging to at least four satellites.

The FAA has been interested in GPS applications for commercial aviation since the program's inception. However, at this time, the FAA still has a major concern with regard to GPS integrity, in terms of satellite coverage and signal confidence.

One integrity issue is "Selective Availability" where, for security reasons, the DOD deliberately degrades accuracy by adding errors to GPS signals. This integrity issue still remains today. The integrity requirement is dependent on the flight phase and its special performance requirements. Using GPS as a sole means of navigation demands a more strict requirement than using GPS in a supplementary role. This integrity issue must be resolved before GPS can be certified for flight phases that need highly precise position information.

TSO-C13f, "Life Preservers." On September 24, 1992, the FAA issued TSO-C13f, which prescribes the minimum performance standards that life preservers must meet in order to be identified with the applicable TSO marking. New models of life preservers that are to be so identified and that are manufactured on or after September 24, 1992, must meet the minimum performance standards set forth in Appendix 1 to the TSO, entitled "*Federal Aviation Administration Standard for Life Preservers.*"

The standards discussed in Appendix 1 pertain to both inflatable (Type I) and non-inflatable (Type II) life preservers. Both types are divided into four categories: Adult, Adult-Child, Child, and Infant-Small Child. Among other things, the standards discussed include those for:

- **materials (strength, adhesion, permeability, seams),**
- **design and construction,**
- **means of inflation and deflation,**
- **buoyancy,**

- **flotation attitude,**
- **retention and donning characteristics,**
- **locator lights,**
- **color,**
- **marking, and**
- **various testing methods.**

TSO-C37d, "VHF Radio Communications Transmitting Equipment Operating within the Radio Frequency Range 117.975 to 137.00 MegaHertz."

On September 23, 1992, the FAA issued TSO-C37d, which prescribes the standard that VHF radio communications transmitting equipment must meet to be identified with this TSO marking. New models of VHF radio communications transmitting equipment that are to be so identified or that are manufactured on or after September 23, 1992, must meet the minimum performance standards set forth in Section 2 of RTCA document No. DO-186, "*Minimum Operational Performance Standards for Airborne Radio Communications Equipment Operating Within the Radio Frequency Range 117.975 - 137.000 MHz,*" Change No. 1, dated March 1985.

This TSO includes only transmitting equipment with 25 kHz channel separation (Class C).

If the equipment design includes a digital computer, the software must be developed in accordance with RTCA Document No. DO-178A, "*Software Considerations in*

Airborne Systems and Equipment Certification," dated March 1985. In accordance with that Document, the manufacturer must submit a Software Aspects of Certification Plan (RTCA/DO-178A Document No. 14) for review and approval. The FAA recommends that this plan be submitted early in the software development process. Early submittal will allow the manufacturer to resolve FAA issues with the software aspects of certification described in the plan (e.g., partitioning, determination of software levels, etc.).

TSO-C127, "Rotorcraft and Transport Airplane Seating Systems." The FAA recently issued the first dynamic seat approval under TSO-C127 to AMI Industries, a manufacturer of flight attendant and crew seats, located in Colorado Springs, Colorado. AMI Industries was granted TSO-C127 approval on October 21, 1992, for the "Forward Facing First Observer Seat Model 1116," which is to be installed on a Boeing Model 767. This observer seat meets the 16g seat requirements of the Aerospace Standard (AS) 8049 which were adopted by TSO-C127, dated March 30, 1992.

AMI Industries is a large producer of attendant and crew seats, and participated as a member of the Aerospace Standard Committee 8049 in the development of test procedures to meet the more stringent seat standards.

TSO-C127 was developed to incorporate the dynamic emergency landing conditions required for new applications of aircraft to be type certificated under Parts 23, 25, 27 or 29 of the Federal Aviation Regulations (FAR).

The new requirements were partially based on studies conducted by the FAA and NASA Langley Research Center. These studies were conducted to compile data on seat performance in survivable accidents, and to determine if a correlation exists between airframe or floor deformation and the performance of the seat in restraining the occupant and preventing fatal injuries.

The dynamic test criteria was developed with the intent of requiring seat and restraint systems to provide impact injury protection and structural performance in an environment equivalent to that seen by the airplane in a survivable crash.

The criteria developed from the studies became rule through amendments to Parts 23, 25, 27 and 29 of the FAR. Additional documents, SAE Aerospace Standard 8049 and Advisory Circular 25.562-1 (*"Dynamic Evaluation of Seat Restraint Systems & Occupant Protection on Transport Airplanes"*), have been developed to provide additional guidance for compliance with the rule. The SAE Aerospace Standard 8049 was used as the basis for the development of TSO-C127.

To obtain a copy of any of the TSO's described above, write to:

**Federal Aviation Administration
Aircraft Certification Service
Aircraft Engineering Division
(AIR-100)
800 Independence Avenue S.W.
Washington, D.C. 20591**



Fuel Tank Access Covers

On July 29, 1992, the FAA issued Advisory Circular (AC) 25.963-1, which sets forth a means of compliance with the provisions of Part 25 of the Federal Aviation Regulations (FAR) dealing with the certification requirements for fuel tank access covers on turbine powered transport category airplanes.

This AC was developed to address the in-service history of failures of fuel tank access covers -- such failures have occurred due to impact with high speed objects, such as failed tire tread material and engine debris following engine failures. Failure of an access cover on a wing fuel tank may result in the loss of hazardous quantities of fuel that could subsequently ignite.

The AC provides guidance for showing compliance with the impact and fire resistance requirements of FAR Section 25.963(e) ("*Fuel Tanks: general*").

Impact Resistance

Since FAR Section 25.963(e) requires that all fuel tank access covers be designed to minimize penetration and deformation by tire fragments, low energy engine debris, or other likely debris, covers should be located in an area where service experience indicates that such a strike is not likely. The FAR does not specify rigid standards for impact resistance because of the wide range of likely

debris that could possibly strike the covers. AC 25.963-1 advises that an applicant should choose to "*minimize penetration and deformation*" by testing covers using debris of a type, size, trajectory, and velocity that represents conditions that would be anticipated in actual service for the airplane model involved. (There should be no hazardous quantity of fuel leakage after impact.)

The access covers, however, need not be more impact resistant than the contiguous tank structure.

AC 25.963-1 provides the following criteria that may be used for evaluating access covers for impact resistance:

(1) Covers located within 30 degrees inboard and outboard of the tire plane of rotation (measured from center of tire rotation with oleo strut in the nominal position) should be evaluated. The evaluation should be based on the results of impact tests using tire tread segments equal to 1 percent of the tire mass traveling at airplane rotation speed (V_R), and distributed over an impact area equal to 1-1/2 percent of the total tread area.

(2) For turbine-powered airplanes, covers that are located within 15 degrees forward of the front engine compressor or

fan plane (measured from the center of rotation to 15 degrees aft of the rearmost engine turbine plane measured from center of rotation) should be evaluated for impact from small fragments (shrapnel) with energies referred to in AC 20-128, "Design Considerations for Minimizing Hazards Caused by Uncontained Turbine Engine and Auxiliary Power Unit Rotor and Fan Blade Failure," issued March 9, 1988.

The covers need not be designed to withstand impact from high energy engine fragments, such as engine rotor segments or propeller blade fragments.

Fire Resistance

FAR 25.963(e)(2) requires that all fuel tank access covers must be fire resistant. The definition of "fire resistant," as specified in Part 1 of the FAR, means "the capacity to withstand the heat associated with fire at least as well as aluminum alloy in dimensions appropriate for the purpose for which they are used."

For the purpose of complying with this requirement, the access cover is assumed to be subjected to fire from **outside** the fuel tank. The fuel tank access covers need not be more fire resistant than the contiguous tank structure.

AC 25.963-1 offers the following advice with regard to testing access covers (that are not as fire resistant as contiguous tank structures):

- The access cover should be tested for five minutes using a burner producing a 2000° F. flame. The test burner and procedures for instrumentation and calibration should be followed as defined in AC 20-135, "Powerplant Installation and Propulsion System: Component Fire Protection Test Methods, Standards, and Criteria," issued February 6, 1990.
- The test cover should be installed in a test fixture representative of the actual installation in the airplane.
- Credit may be allowed for fuel as a heat sink if the covers will be protected by fuel during all likely conditions.
- The maximum amount of fuel that should be allowed during this test is the amount associated with reserve fuel.
- The static fuel pressure head should be accounted for during the burn test.
- There should be no burn-through or fuel leakage at the end of the tests; although damage to the cover and seal is permissible.

To obtain a copy of AC 25.963-1, contact your cognizant Aircraft Certification Office (ACO).



The FAA's Parts Approval Action Team

As a result of the recently implemented *Suspected Unapproved Parts Detecting and Reporting Program*, described in Advisory Circular AC 21-29A, the FAA has learned that a large number of parts have been distributed directly to customers by suppliers to FAA production approval holders (PAH) without the PAH's authorization.

Even though many of these suppliers are the original equipment manufacturers, and may also be the only source for the part, the part supplied is considered to be unapproved because it was not accepted by the PAH's quality assurance system.

This fact has led the FAA to charter a "*Parts Approval Action Team (PAAT)*." The goal of the PAAT is to create FAA policy, procedures, and guidance that will enhance compliance with FAA regulatory requirements for replacement and modification parts. The PAAT mission is to expedite Parts Manufacturer Approval (PMA) applications by suppliers and sub-tier suppliers to PAH's and, in conjunction with the FAA's Flight Standards Services (AFS), to facilitate the airworthiness determination of parts that have been shipped to customers.

The team's work has been divided into three phases:

Phase I

Objective: To develop guidance on the approval of PMA applications based on evidence of a "*Licensing Agreement*." Phase

I is already completed. Guidance has been issued in FAA Action Notice 8110.45, "*Parts Approval Action Team, Phase I; Parts Manufacturer Approval under Evidence of Licensing Agreement*."

This notice describes an accelerated authorization process, separate from the FAA's standard procedures, for application and issue of FAA PMA's. The FAA will facilitate certain applicants by issuing their PMA authorization in accordance with this procedure in the shortest possible time period.

Phase II

Objective: To address applicants who do not have a licensing agreement, but may qualify for PMA under "*Identicality*" procedures. Phase II has been developed, but not completed as yet. The team expects that a relevant document will be published by sometime this summer.

Phase III

Objective: To develop policy and procedures to ascertain and document the airworthiness of replacement and modification parts that are in service, in an operator's inventory, or a distributor's stock. Phase III is in the developmental stage at this time.



FAA Approved Parts Seminar: 1993 and 1994 Schedule

The FAA is conducting Approved Parts Seminars in various cities over the next two years. These seminars have been established as a way to make the aviation public aware of the necessity of ensuring that only FAA-approved parts are used on certificated aircraft, aircraft engines, propellers, and appliances.

The seminars are open to the aviation public, including aircraft owners, repair stations, air carriers, aircraft mechanics, aircraft manufacturers, and all designees. Each seminar consists of a review of:

- the Federal Aviation Regulations (FAR) and associated publications (advisory circulars, notices, orders, etc.);
- examples of unapproved parts;
- sources for obtaining approved parts;

- persons authorized to install approved parts on certificated aircraft;
- the processes required in approving replacement parts; and
- the litigation and liability aspects of the production for sale of unapproved parts and subsequent installation on certificated aircraft.

Each seminar is limited to 80 participants. However, due to the large participation expected, there may be more than one seminar held at some locations.

For more information on participating in any particular seminar, contact the FAA office [Flight Standards District Office (FSDO), Certification Management Office (CMO), or other office indicated] listed in the table below.

1993 SCHEDULE

DATES	LOCATION	ATTENDING OFFICE(S)
February 23-24	San Diego, CA	SAN FSDO (San Diego, CA) RAL FSDO (Riverside, CA)
March 9-10	Winston-Salem, NC	INT FSDO (Winston-Salem, NC) RDU FSDO (Raleigh, NC) CLT FSDO (Charlotte, SC) CAE FSDO (West Columbia, SC)
March 30-31	Houston, TX	HOU FSDO (Houston, TX)
April 13-14	Long Beach, CA	LGB FSDO (Long Beach, CA) LAX FSDO (Los Angeles, CA) VNY FSDO (Van Nuys, CA)

1993 SCHEDULE (continued)

DATES	LOCATION	ATTENDING OFFICE(S)
May 11-12	San Jose, CA	SJC FSDO (San Jose, CA) OAK FSDO (Oakland, CA) SFO FSDO (Burlingame, CA) SFO-CMO (Burlingame, CA)
May 25-26	Las Vegas, NV	LAS FSDO (Las Vegas, NV) SDL FSDO (Scottsdale, AZ) PHX-CMO (Phoenix, AZ)
June 8-9	Chicago, IL	DPA FSDO (West Chicago, IL) ORD FSDO (Schiller Park, IL) SBN FSDO (South Bend, IN) MKE FSDO (Milwaukee, WI)
June 22-23	Wichita, KS	ICT FSDO (Wichita, KS) MCI FSDO (Kansas City, MO) LNK FSDO (Lincoln, NE)
July 13-14	Portland, OR	PDX FSDO (Hillsboro, OR)
July 27-28	Seattle, WA	SEA FSDO (Renton, WA)
August 10-11	Billings, MT	HLN FSDO (Helena, MT) BIL FSDO (Billings, MT) BOI FSDO (Boise, ID)
August 24-25	Anchorage, AK	ANC FSDO (Anchorage, AK) FAI FSDO (Fairbanks, AK) JNO FSDO (Juneau, AK)
September 21-22	Valley Stream, NY	NYC FSDO (Valley Stream, NY) TEB FSDO (Teterboro, NJ) FRG FSDO (Farmingdale, NY) ABE FSDO (Allentown, PA) NYC-CMO (Jamaica, NY)
October 19-20	Atlantic City, NJ	PHL FSDO (Philadelphia, PA)
November 2-3	Sacramento, CA	SAC FSDO (Sacramento, CA) FAT FSDO (Fresno, CA) RNO FSDO (Reno, NV)
November 16-17	Jackson, MS	JAN FSDO (Jackson, MS) LTR FSDO (Little Rock, AR) BTR FSDO (Baton Rouge, LA)
December 7-8	Atlanta, GA	ATL FSDO (Atlanta, GA) BHM FSDO (Birmingham, AL)

1994 SCHEDULE

DATES	LOCATION	ATTENDING OFFICE(S)
January 11-12	San Juan, PR	SJU FSDO (San Juan, PR)
January 25-26	Baltimore, MD	BAL FSDO (Baltimore, MD) DCA FSDO (Washington, DC)
February 15-16	Dallas/Ft. Worth, TX	DFW FSDO (Dallas/Ft. Worth, TX) DAL FSDO (Dallas, TX) FTW FSDO (Forth Worth, TX) DFW-CMO (Dallas/Ft. Worth, TX)
March 1-2	St. Louis, MO	STL FSDO (St. Louis, MO)
March 15-16	Indianapolis, IN	IND FSDO (Indianapolis, IN) SPI FSDO (Springfield, IN) CVG FSDO (Cincinnati, OH)
April 5-6	Lansing, MI	SBN FSDO (South Bend, IN) DTW FSDO (Belleville, MI) GRR FSDO (Grand Rapids, MI)
April 19-20	Cleveland, OH	CLE FSDO (Cleveland, OH) CMH FSDO (Columbus, OH)
May 3-4	Minneapolis, MN	MSP FSDO (Minneapolis, MN) MSP-CMO (Minneapolis, MN)
May 24-25	Bedford, MA	BED FSDO (Bedford, MS) BOS FSDO (Boston, MS) BDL FSDO (Windsor Locks, CT) PWM FSDO (Portland, ME)
June 7-8	Albany, NY	ALB FSDO (Albany, NY) ROC FSDO (Rochester, NY)
July 12-13	Pittsburgh, PA	AGC FSDO (West Mifflin, PA) PIT FSDO (Corapolis, PA)
July 27-28	London, England	AEU-IFO (London, England)
August 2-3	Frankfurt, Germany	AEU-IFO-51 (Frankfurt, Germany)
August 23-24	Nashville, TN	BNA FSDO (Nashville, TN) MEM FSDO (Memphis, TN) LOU FSDO (Louisville, KY)
September 13-14	Richmond, VA	FIC FSDO (Sandston, VA)



Legal Ramifications of the Production, Sale, and Use of Unapproved Parts

An "unapproved part" means any part that is not produced under an FAA-approved production system. Such systems include production certificates, parts manufacturer approvals (PMA), and technical standard order (TSO) authorizations.

In most cases, production certificates are held by major aircraft or engine manufacturers, such as Boeing, McDonnell Douglas, Pratt & Whitney, General Electric; or, in the case of small airplanes, by companies such as Cessna, Beech, Piper, and Lycoming. TSO's relate to equipment that is designed and produced independently of the aircraft on which it may be installed, such as avionics equipment and tires. Most of the approved replacement parts that are not produced under the production certificate are produced by PMA holders.

In order to obtain a PMA, applicants must show two things:

- that they have an FAA-approved design for the part; and
- that they have a quality control system that ensures that the parts produced will conform to that design.

Only if these two requirements are met can the FAA and the public be assured that the parts will be safe for their intended use.

FAR Section 21.303 spells out the FAA's requirements for obtaining and producing parts under a PMA. Paragraph (a) states:

"Except as provided in paragraph (b) of this section, no person may produce a modification or replacement part for sale for installation on a type certificated product unless it is produced pursuant to a Parts Manufacturer Approval issued under this subpart."

Before reviewing the exceptions in paragraph (b), it is worthwhile to first understand the meaning of the specific terms used in paragraph (a).

When the FAA adopted this regulation, it stated, "the FAA is not aware of any parts that would be produced for sale for installation on a type certificated product that should not be covered by the requirements of FAR Section 21.303." To carry out this intent, the FAA has interpreted this regulation quite broadly.

"Person" is defined to include, not just individuals, but also corporations and other business entities.

"Product" includes not just the fabrication of parts, but also ordering of parts to be produced by someone else where the order includes specifications or materials.

"For sale for installation" includes not just situations where the producer **knows** that a part will be installed on a type certificated product, but also where it's reasonably likely that they will be installed. The key factor is the **purpose** of the production.

For example, many parts producers (whether they have PMA's or not) will produce parts without knowing who will ultimately purchase or use them. These parts are placed in inventory and sold as orders come in. Under these circumstances, where the producer normally engages in the business of supplying aviation parts, the FAA takes the position that this production is "*for sale for installation*," within the meaning of FAR Section 21.303.

Finally, a "*type certificated product*" is any aircraft, engine, or propeller for which a type certificate has been issued.

Paragraph (b) of FAR Section 21.303 contains a number of exceptions from the general requirement that parts producers obtain a PMA. In understanding these exceptions, it is important to keep in mind the two basic requirements for PMA: that parts have an approved design and that they be produced under a quality control system that ensures that the parts will conform to their design.

Two of the exceptions apply to other FAA-approved production systems:

- **production certificates and**
- **technical standards orders.**

Both of these systems also provide for safe designs and quality control.

A third exception is for

- **parts produced by an owner or operator for maintaining or altering his own product.**

This exception is based on the requirement that aircraft owners and operators are responsible for the airworthiness of their aircraft. Therefore, production and use of an unairworthy part would be a violation of other regulations. In addition, maintenance practices are comprehensively regulated under other parts of the Federal Aviation Regulations. Therefore, this exception also ensures that parts will be safe.

The fourth and last exception is for:

- **standard parts (such as bolts and nuts) conforming to established industry or U.S. specifications.**

With this exception, the FAA recognizes that many parts used in aviation are also used in other applications and that other systems for design approval and quality control have been established to ensure their safety. As long as the parts conform with those specifications, it would be redundant for the FAA to impose additional requirements.

In summary, if someone produces parts for aviation use and does not fall within one of the exceptions, FAR Section 21.303 requires that they obtain a PMA. Under the Federal

Aviation Act, each part produced without a PMA is considered to be a separate violation, and could subject the producer to a maximum civil penalty of \$1,000 per violation. If you are, or want to become, a parts producer and have any questions about this regulation, you should contact your nearest Manufacturing Inspection District Office.

As far as the legal aspects of the use of unapproved parts in maintaining aircraft, Part 43 of the FAR sets forth the requirements for aircraft maintenance. FAR Section 43.13 contains the general performance standards for all maintenance. This section requires two things:

First, that all persons maintaining aircraft use practices that are acceptable to the FAA; and

Second, that the work be performed in such a way that the condition of aircraft is *"at least equal to its original or properly altered condition."*

The FAA has taken the position that the use of unapproved parts may violate both of these requirements. In Advisory Circular 20-62C, the FAA states that if a parts user cannot establish that a part was produced by an approved producer, the only way that a user can determine whether a part can be used is if its airworthiness can be established by tests and inspections.

"Airworthiness" means that the part both conforms to its type design and is in a condition for safe operation. But most parts users do not have ready access to a part's type design, since this is usually proprietary data

of the manufacturer. Even if they did, it is frequently impossible by using inspections and tests to determine conformity with materials or process specifications, which are critical elements of type design.

Therefore, as a practical matter, the only way a parts user can determine the airworthiness of most parts is by making sure that they were produced by an approved producer. Under FAR Section 43.13, use of part when the part's airworthiness is in question is not an acceptable maintenance practice; and it would not result in the aircraft's condition being at least equal to its original or properly altered condition.

As a result, each time an unapproved part is installed, the installer may be subject to civil penalties for violations of both parts of FAR Section 43.13. In most cases, the Federal Aviation Act provides for a maximum civil penalty of \$1,000 per violation. In the case of air carriers, the maximum civil penalty is \$10,000 per violation.

In addition, violations may subject the installer to a certificate action to suspend their certificate. Finally, use of unapproved parts may render the aircraft unairworthy, which could lead to further violations against the operator.

But the bottom line is safety. No matter how "acceptable" a part **looks**, unless the user can determine that it was produced by an approved producer, there is no way to predict how it will perform in service.



Airworthiness Directives (AD) Applicable to U.S. Type Certificated Products Not Currently on the U.S. Registry

The FAA has received numerous questions regarding the appropriateness of issuing an AD when an unsafe condition is found to exist in a U.S. type certificated product that is not currently included on the U.S. Aircraft Registry. In response to these questions, the FAA offers the following explanation.

A amendment 94 to the International Civil Aviation Organization (ICAO) Annex 8 obligates the FAA to exchange continuing airworthiness information with ICAO member states. Bilateral airworthiness agreements (BAA) between the U.S. and other countries also require the exchange of such information.

Under the provisions of most BAAs, the FAA and the bilateral country's civil airworthiness authority (CAA) are jointly responsible for keeping each other informed of continuing airworthiness information that is necessary to ensure the safety of aeronautical products, both imported and exported.

The FAA's obligation under ICAO and BAAs is met by notifying the appropriate CAAs of

- **unsafe conditions in any product that has a U.S. type certificate; and**
- **the necessary corrective action that will return the product to an airworthy condition. The vehicle for such notification is an AD.**

When the FAA identifies an unsafe condition in a U.S. type certificated product, an AD must be issued, even if the product is not currently included on the U.S. Aircraft Registry.

The fact that a type certificated product is not on the Registry or is not being operated in the U.S. does not preclude the FAA from issuing an AD when a determination is made that an unsafe condition exists in that product. This is true even if the affected product is an engine or propeller, and it applies even if the affected product is installed on an aircraft that does not have a U.S. type certificate.

(An exception to the latter is if the unsafe condition is peculiar to the installation of a U.S. type certificated product on a particular make and model aircraft that does not have a U.S. type certificate.)

When a CAA identifies an unsafe condition in a U.S. type certificated product and advises the FAA of the problem by means of a mandatory service bulletin or an AD, the FAA must take appropriate action even through the product may not currently be included on the Registry.

The FAA then evaluates the CAA's action to determine if a U.S. AD is appropriate in the same manner as if the FAA initiated the action. The FAA must make an independent determination that an unsafe condition exists and that an AD is necessary. The FAA may

also determine that AD action is inappropriate.

By issuing these types of ADs -- applicable to U.S. type certificated products not currently

on the U.S. Registry -- the FAA ensures that it meets its obligations under international agreements and ensures the safety of these products entering the U.S. Registry in the future.



Regulatory Glossary

The following is a list of terms and a summary of several Federal Acts and Orders that will provide designees with a quick reference to understanding regulatory terms.

Administrative Procedure Act (APA) (1946): The APA established the basic procedures for rulemaking. Generally, there are two types of rulemaking:

- **formal rulemaking**, which involves trial-type hearings, and
- **informal rulemaking**, which requires notice and comment.

"*Notice and comment*" involves the publication of a Notice of Proposed Rulemaking (NPRM) that explains the subjects and issues involved in the rulemaking in language easily understood by non-experts. The public is given an opportunity to comment on the proposed rule, and the published final rule responds to the comments and contains a general statement of the basis and purpose of the rule. The final rule may not become effective until 30 days after its publication.

There are certain rulemaking actions that are exempt from the notice and comment requirement:

- **Rules relating to public property, loans, grants, and contracts.**
- **Rules relating to agency personnel and management.**
- **Rules relating to military and foreign affairs.**
- **Rules relating to agency organization, procedure, or practice.**
- **Interpretive rules and general statements of policy.**
- **"Good cause exemptions" -- emergency rules necessary for public safety and technical corrections.**

Certain rulemaking actions are also exempt from the 30 day effective date:

- **Interpretive rules and general policy statements.**
- **Emergency rules.**

- **Substantive rules that grant or recognize an exemption or relieve a restriction.**

The APA grants individuals the right to petition for rulemaking.

Advanced Notice of Proposed Rulemaking (ANPRM): An Advance Notice of Proposed Rulemaking is sometimes issued when an agency wants to solicit ideas before issuing a Notice of Proposed Rulemaking (NPRM). It may also be called a "*notice of intent*" or simply a "*request for comments*." The ANPRM is used by an agency as a vehicle for obtaining public participation in the formulation of a regulatory change before the agency has done significant research or investigation on its own.

However, an agency cannot use the ANPRM's notice and comment period as the only basis for issuing a final rule. If an agency chooses to use an ANPRM, it still must issue an NPRM before issuing a final rule on that subject.

If no regulatory project develops from the ANPRM, a "*notice of withdrawal*" is usually issued, although it is not required.

Advisory Circular (AC): An Advisory Circular provides information that the public and industry use as guidelines. An AC can outline acceptable means of complying with regulations or simply provide general information. Unlike rules, however, AC's are not enforceable; they are merely advisory.

Code of Federal Regulations (CFR):

The Code of Federal Regulations contains the rules of Federal agencies in codified form. The CFR is divided into 50 titles, each broken down into chapters, subchapters, parts, and sections. Each agency's rules are found in one or more chapters. FAA rules are in Title 14, Chapter 1, Subchapters A through O, Parts 1-199. Each CFR title is revised annually to incorporate all additions and amendments published during the previous year in the Federal Register. Title 14 is revised as of January 1 of each year.

Comment Period: This is a period of time for public comment after the publication of a petition, Advance Notice of Proposed Rulemaking (ANPRM), or Notice of Proposed Rulemaking (NPRM) in the Federal Register. The comment period is usually 20 days for petitions for exemption, 60 days for petitions for rulemaking, and 45 to 60 days for NPRM's. For complicated NPRM's, it could be 120 days or more.

During the comment period, interested persons are invited to participate in the making of a proposed rule by submitting such written data, views, or arguments as they may desire on the overall regulatory, economic, environmental, and energy aspects of the proposed rule.

All communications received on or before the closing of comment period will be considered before taking action on the proposed rule. The proposals contained in a notice may be changed in light of the comments received. All comments submitted are available, both before and after the closing date for comments, for examination by the public.

Department of Transportation (DOT)

Policies and Procedures: In Order DOT 2100.5, "*Policies and Procedures for Simplification, Analysis, and Review of Regulations*," DOT adopted policies that require a Regulatory Analysis for major or significant rules, and a regulatory evaluation for all other rules. The analysis or evaluation must consider the economic costs and benefits of the proposed rule.

For rules defined as **major or significant**, the analysis must also discuss the problem/issues that make the rule significant, a description of the alternatives that were considered, an evaluation of other relevant consequences, and the reasons for the agency's choice.

"*Major*," under this order, is defined the same as under Executive Order 12291 -- \$100 million annual effect on the economy; substantial impact on costs, consumer prices, industry or government prices; or a substantial impact on the balance of trade.

"*Significant*," under this order, means that the rule:

- Concerns a matter of substantial public interest or controversy.
- Would have a substantial impact on another part of the Federal government or state/local governments.
- Has a substantial impact on safety problems.
- Initiates a substantial regulatory program or change in policy.
- Is substantially different from international requirements or standards.
- Involves important departmental policy.

The rule documents must include a statement about the agency's finding as to whether the rule is significant.

Docket: A docket is a file that usually contains all relevant material that an agency intends to use in reaching a decision about a rulemaking or adjudication. All public comments are included in a rulemaking docket. When a petition is filed or a rulemaking project is accepted, a docket is opened and assigned a docket number.

Emergency Rule: An emergency rule allows an agency to bypass the notice and comment requirements if the agency needs to adopt a rule quickly in order to ensure public safety. Although the effective date for a rule is usually set for a minimum of 30 days after publication in the Federal Register, the minimum can be waived for an emergency rule.

Executive Order (E.O.) 12291, Federal Regulation:

E.O. 12291 is the order that requires that the benefits of any rules must outweigh the costs. It mandates that the least costly alternative be adopted. It gives the Office of Management and Budget (OMB) the right to review all rules. For all **major** rules, the agency must prepare a Regulatory Impact Analysis (RIA) detailing the costs and benefits of the proposed rule.

Under E.O. 12291, a "*major*" rule is defined as one that:

- Would have an annual effect of more than \$100 million on the economy;

- Would cause a major increase in costs for consumers, industries, governments, or regions; or
- Would have significant adverse effects on competition, employment, investment, productivity, innovation, or the ability of U.S. industries to compete with foreign industries.

Executive Order 12498, Regulatory Planning Process:

This E.O., issued in January 1985, creates an annual regulatory agenda for the Federal government, handled by the Office of Management and Budget (OMB). The agenda must include all regulatory projects or potential regulatory projects that are **significant**. A rule is or would be "*significant*" if it is:

- A major rule under E.O. 12291.
- A priority of the agency head.
- The subject of a statutory or judicial deadline.
- Of unusual interest to the public or other Federal agencies.
- Likely to establish an important new policy or legal precedent.
- Designated by the Director of OMB as significant.

Executive Order 12606, The Family:

This E.O., issued in September 1987, sets out policymaking criteria that Federal agencies are to consider in formulating and implementing policies and regulations that may have a significant impact on family formation, maintenance, and general

well-being. Agency heads are required to certify in writing, to the extent permitted by law, that proposed regulatory and statutory provisions have been assessed under the E.O. criteria and to state "*how such measures will enhance family well-being.*"

Executive Order 12612, Federalism:

This E.O., issued in October 1987, sets out certain principles of Federalism, policymaking criteria, special requirements for dealing with preemption issues, and procedures for agency implementation. If a proposed policy (legislative or regulatory) has sufficient Federal implications, the responsible agency must prepare a Federalism Assessment, which must accompany any submission to OMB under E.O. 12291.

Since the Federal Aviation Act has been interpreted to preempt any State laws affecting aviation, most FAA regulatory documents do not require a Federalism Assessment, but must contain a statement as to why one has not been prepared.

Federal Advisory Committee Act (FACA):

When an agency establishes or uses a group or committee with some members who are full-time Federal employees to obtain advice or recommendations, the FACA requires that it have an approved charter and follow the FACA guidelines:

- The advisory committee can only be set up after public notice and after a determination that it is in the public interest.

- The committee must have a clearly defined purpose.
- The membership must be fairly balanced in terms of points of view.
- The meetings must be open to the public.
- The "Proposed Rule" section announces rules that agencies expect to issue in the future and, in most cases, provides the proposed text of those rules.
- The "Notices" section contains documents that agencies are required to publish or choose to publish in the Federal Register that are not part of the codified regulations system. Examples are announcements of meetings, hearings, and investigations; delegations of authority; filing of petitions or applications; and availability of agency reports, studies, guidelines, and environmental impact statements.

Federal Aviation Regulations (FAR):

Federal Aviation Regulations are published in Chapter 1 of Title 14 of the CFR. The FAA also publishes an updated copy of each part. This updated version includes the preambles of the final rules, as published in the Federal Register, for all amendments that have been adopted since the last complete revision of the part. This loose-leaf system, including the preambles, is also referred to as the "FAR."

Federal Register: The Federal Register is a daily publication (5 days a week, excluding Federal holidays) of the Federal government that provides official notice and record of Federal agency rulemaking actions, proposed rulemakings, and a host of notices and announcements of other agency actions and meetings.

The Federal Register has three main sections:

- The "Rules and Regulations" section contains (1) the text of the regulations that will appear in the next edition of a specific Title of the CFR, and (2) a preamble containing background and other information to explain the purpose and effect of the regulation.

Final Rule: The Administrative Procedure Act requires that final rules, as adopted after notice and comment, be published in the Federal Register. The preamble of the final rule must explain it, respond to comments received about it, and account for the differences between the proposed and the final versions of the rule.

Formal Rulemaking: Formal rulemaking requires that the rulemaker make a decision on the basis of a "record" that is usually created at a formal, trial-type hearing presided over by an Administrative Law Judge.

Freedom of Information Act (FOIA) The Freedom of Information Act (1966) requires that Federal agencies make certain information available to the public.

Prior to the passage of FOIA, and except for those types of information either traditionally made available to the public or required by law to be made public, Federal agencies could arbitrarily decide what information to release to the public, and who could receive certain types of information.

Now agencies are required to honor requires for any material that does not fall into one of the nine specifically exempt categories. These categories are:

1. Classified national defence of foreign policy documents.
2. Materials related solely to an agency's personnel rules and practices.
3. Materials specifically exempted from disclosure by statute.
4. Trade secrets and commercial or financial information obtained from a person and privileged or confidential.
5. Inter-agency or intra-agency memoranda or letters that may be deliberative (pre-decision making) in nature.
6. Personnel or medical files, the disclosure of which would be an invasion of personal privacy.
7. Investigatory records compiled for law enforcement purposes.
8. Information concerning financial institutions.
9. Geological information concerning wells.

After receiving a written request for information under FOIA, an agency has 10

working days in which to either comply with the requires or send a written denial specifying which of the exempt categories the requested material falls into.

The denial letter must also contain instructions for appealing the decision within the agency. if an agency also rejects the appeal, the requester has the option of taking the agency to court.

Incorporation by Reference: Certain materials, such as technical standards, may be made part of the CFR by reference. These materials are not printed in the rule, but are referenced and become legally part of the rule. To be eligible for incorporation by reference, the material must not change frequently, usually must be voluminous, must be available to the public, and must be approved by the Director of the Federal Register. Any changes in the reference material require notice and comment.

Informal Record: A rulemaking record or file may be created in informal rulemaking. At a minimum, the informal record would contain the NPRM, any studies or reports referred to in the NPRM, public comments, records of any hearings or meetings, and the final rule document.

Informal Rulemaking: Informal rulemaking involves publishing an NPRM soliciting comments from interested parties, considering the comments, and publishing a final rule. Informal rulemaking may involve a hearing at the discretion of the agency.

Major Rule: Executive Order 12291 defines a rule as "major" if it has an annual effect on the economy of \$100 million. Major rules require a Regulatory Impact Analysis. The benefits of a proposed rule must exceed its costs. Department of Transportation (DOT) policies (Order DOT 2100.5) have an identical definition of "major."

National Environmental Policy Act (NEPA): The National Environmental Policy Act requires that all agencies of the Federal government include a detailed environmental impact statement in every proposal for a major Federal action that significantly affects the quality of the human environment. The environmental impact statement addresses listed subjects and applies substantive criteria set forth in the Act. Every agency with legislative rulemaking authority should have regulations which establish the procedures for assessing the need for an environmental impact statement and for preparing and obtaining comment on the statement.

Notice and Comment: Informal rulemaking procedures require that an agency publish a notice explaining its intentions and that it give the public a chance to comment before deciding on a final rule. Notice and comment may be bypassed if the agency must adopt an emergency rule or if the rule changes are technical and involve little agency discretion.

Notice of Proposed Rulemaking (NPRM): A Notice of Proposed Rulemaking, required under the

Administrative Procedure Act (APA) for informal rulemaking, serves to inform the public that a Federal agency is considering a regulatory change. An NPRM must be published in the Federal Register unless all of the persons who would be affected by the proposed change are named and either personally served or otherwise have actual notice.

The NPRM describes the rule changes being considered and tells the public how they may participate in the rulemaking process. In most cases, the public is invited to participate by submitting written comments to the agency within the comment period, usually 45 to 60 days.

If the agency plans to hold a public hearing, the time and place of the hearing are often announced in the NPRM.

Paperwork Reduction Act: The Paperwork Reduction Act was enacted to minimize the Federal paperwork burden on individuals and small entities. It comes into play when proposed rules include requirements for data collection. Under this act, no rule may require new data collection unless the benefits outweigh the cost. The data collection must be necessary for the proper performance of the agency's functions.

Petition: The public may petition for exemptions or for rulemaking actions. Each petition is given a docket number, and a summary of the petition is published in the Federal Register (This does not apply to petitions for exemptions to Airworthiness Directives, however.) Unless a petition is withdrawn, the FAA must either grant or

deny each petition for an exemption, and either deny a rulemaking petition or proceed with rulemaking action.

Preamble: The preamble is the part of a rulemaking document that explains the reasons for the regulatory action of a Federal agency. The preamble contains the "*basis and purpose*" of a regulation, as required by the Administrative Procedure Act. It also contains information about possible hearings, related materials that are available to the public, contact persons, comment dates, and similar details. A preamble is not a regulation and, although it is published in the Federal Register with a regulation, it is not reprinted in the CFR.

A preamble is not legally enforceable, but it is an important aid in gaining an understanding of why an agency is acting or refusing to act. The preamble is also part of the "*informal record*," the material that would be reviewed by a court to determine if an agency has acted in an arbitrary or capricious manner. This latter point bears on the question of whether or not an agency's regulatory action is legal.

Regulatory Agenda: Both Executive Order 12291 and the Regulatory Flexibility Act (Reg Flex) require Federal agencies to publish semi-annual regulatory agendas in the Federal Register in April and October.

E.O. 12291 requires agencies to publish agendas that list every rulemaking project underway within the agency, to note whether the rule is "*major*" under the terms of the E.O., and to list a name and phone number for obtaining further information.

The Reg Flex requires agencies to list those proposed rules that are likely to have a significant impact on small businesses and other small entities.

The publication of these agendas allows individuals and businesses to get involved in the rulemaking process long before the agency has reached the NPRM stage.

Regulatory Evaluation: Under DOT policies, a regulatory evaluation (Reg Eval) analyzing the costs and benefits must be done for all non-major rules. If the impact of the rule is minimal, a full evaluation is not necessary, but the rule must include a statement explaining the basis for the decision not to include an evaluation.

Regulatory Flexibility Act (Reg Flex): Reg Flex requires an agency to consider the impact of proposed rules on small entities -- small businesses, nonprofit organizations, and local governments. If there is a significant impact on a substantial number of small entities, the agency must prepare an Initial Regulatory Flexibility Analysis (RFA) for the NPRM as well as a final RFA.

Reg Flex requires the agency to publish a semiannual agenda of rulemaking projects that may be "*significant*" under Reg Flex. Reg Flex does not define "*significant*," however; the FAA has adopted its own standards. Reg Flex does not mandate an outcome, *i.e.*, an agency can adopt a rule even if it has a negative impact. The RFA's must explain what alternatives were considered and why they were rejected. Reg Flex requires a review on a 10-year cycle of all rules to minimize any impact on small entities.

Regulatory Flexibility Analysis: A Regulatory Flexibility Analysis (RFA) is required for "significant" proposed rules under the Reg Flex Act. It evaluates the costs and other impacts of a proposed rule on small entities. It must explain the agency's choice and evaluate the alternatives the agency rejected. Its outcome is not mandated; in other words, an agency is not required by the Act to choose the least costly action or the one with the least impact on small entities.

Regulatory Impact Analysis: Under the rules of E.O. 12291, a Regulatory Impact Analysis (RIA) must be prepared for all "major" proposed rules to evaluate the costs and benefits of a proposed rule and of rejected alternatives. The least costly alternative should be chosen. The Office of Management and Budget (OMB) reviews the RIA. It can be combined with the Regulatory Flexibility Analysis (RFA).

Significant: The Reg Flex Act defines a rule as "significant" if it has a substantial impact on small entities. If a rule is significant, a Reg Flex Analysis is required.

DOT Order 2100.5 defines a rule as "significant" if it concerns a matter of substantial public interest or controversy; has a substantial impact on safety or other parts of the government; initiates a substantial regulatory program or change; is substantially different from international standards or requirements; or involves important department policy. If a rule meets one or more of these criteria, a Reg Flex Analysis is required.

Executive Order (E.O.) 12498 defines a rule as "significant" if it is a major rule under E.O.

12291; a priority of the agency head; a subject of unusual public or government interest; likely to establish an important new policy; subject to statutory or judicial deadline; or designated by the Director of OMB as significant. Rules that are significant under E.O. 12498 must be summarized in the annual government regulatory program.

Supplemental Notice of Proposed Rulemaking (SNPRM): If an agency intends to make a substantive change in proposed rule (NPRM) or part of a proposed rule that would be considered beyond the scope of the originally issued NPRM, it may issue an SNPRM to give the public a change to comment on the change. The agency may proceed with a final rule on other parts of the proposal while comments on the SNPRM are being made.



From the FAA Archives: The First Airworthiness Directive (AD)

Airworthiness Directives (AD) are Federal Aviation Regulations that are issued to correct unsafe conditions that have been identified in aircraft and aeronautical products.

The first AD was issued in 1941 and read (in total) as follows:

"41-47-01 DOUGLAS: Applies to all DC3 series aircraft: Each time a control surface is overhauled or repaired, the surface should be rebalanced. (Douglas Service Bulletin No. 207 contains instructions on rebalancing.)"

(A far cry from the sometimes long and complicated AD's that are issued nowadays!)

Seattle ACO DER Survey

On November 10, 1992, a survey was mailed to all of the independent Designated Engineering Representatives (DER) appointed by the Seattle Aircraft Certification Office (ACO). The ACO requested that the survey be completed and returned before Christmas. To date, the return rate is approximately 39%.

The Seattle ACO would like to begin compiling the results. If you haven't already done so, please take the time to complete the survey and return it. If you are a Seattle ACO-appointed independent DER who did not receive a survey and would like to participate, please call the Seattle ACO Manager, Don Riffin, or the Assistant ACO Manager, Stu Miller, at (206) 227-2180 and request a copy.

The FAA values your input as a means of improving its service to the aviation community.

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